TECHNICAL ABSTRACTS

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LEAD DEVELOPMENT ASSOCIATION

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LEAD ABSTRACTS

A Selection of Abstracts of Literature and Patents on the Utilisation of Lead and its Alloys

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Technical Papers 243–273
Patents 274–294

ISSUED BY THE

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CONTENTS

PART I

TECHNICAL PAPERS

ANALYSIS

243 THE DETERMINATION OF BISMUTH IN LEAD AND LEAD CABLE-SHEATHING ALLOYS — *J. H. Thompson and B. W. Peters*

Analyst, March, 1959, 84, 180-182.

The bismuth is extracted as diethyldithiocarbamate complex in chloroform, after which it is determined as yellow bismuth thiourea complex by absorptiometric methods. Good results are obtained in the range .002–.06% bismuth in lead and lead cable-sheathing alloys.

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244 THE DETERMINATION OF LEAD IN PLATING ELECTROLYTES USING ETHYLENEDIAMINE TETRA-ACETIC ACID (DI-SODIUM SALT) AND XYLENOL ORANGE INDICATOR — *K. E. Langford*

Electroplating and Met. Finishing, March, 1959, 12(3), 103, 119.

Hydroxylamine hydrochloride is added to lead fluoborate or perchlorate plating solution, followed by Xylenol Orange as indicator. This is followed by the addition of hexamine and the solution titrated with EDTA to a very sharp bright yellow end point.

BATTERIES

245 INTERNATIONAL SYMPOSIUM ON BATTERIES, OCTOBER, 1958 — *Ministry of Supply Signals Research and Development Establishment*

Brochure, 1959. Ministry of Supply, SRDE, Christchurch, Hants.

Includes papers on new alloys for battery grids; fundamental problems in the development of storage batteries; the evolution of stibine from lead-acid batteries; the lead dioxide electrode system, and other subjects.

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246 A LEAD-TIN-BARIUM ALLOY FOR THE POSITIVE GRIDS OF LEAD-ACID BATTERIES — *N. L. Parr, A. Muscott and A. J. Crocker*

J. Inst. Metals, June, 1959, 87(10), 321-329.

Factors to be considered during new alloy development have been discovered as a result of metallurgical examination of grid deterioration during service. An alloy containing 3–3½% tin and .07–.1% barium has been shown in laboratory tests to have a combination of castability, creep strength, stiffness and resistance to anodic stress-corrosion.

BEARINGS

247 THE EFFECT OF SURFACE PREPARATION ON THE ADHESION OF BEARING METAL TO STEEL — *C. J. Thwaites*

Metallurgia, March, 1959, 59, 121-124.

The author concludes that pickling is to be preferred to shot-blasting as a pre-treatment where maximum bond strength is required.

COATINGS

248 THE LEAD IRON INTERFACE *E. Pelzel*

Metall, June, 1959, 13(6), 552-554.

(In German.) Relation between the non-wetting of iron by molten lead, and the mutual insolubility of iron and lead is discussed. It is shown that wetting will take place if iron is freshly reduced from oxide. Effect of tin and antimony additions to the lead are considered.

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249 FURTHER DEVELOPMENT OF METAL SPRAYING TECHNIQUE *H. Reininger*

Metalloberfläche, Feb., April, May, 1959, 13(2, 4, 5), 49-52, 116-118, 147-150.

(In German.) Wide coverage of the whole subject over three issues.

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250 VITREOUS ENAMELLED ALUMINIUM *"Light Metals"*

Light Metals, May, 1959, 22, 154-156. Ind. Finishing, July, 1959, 11, 14-15.

Describes manufacture of inorganic vitreous coatings, which may or may not contain lead; application of the coating and properties of finished product. Also describes the uses of the product in building and for household articles.

CORROSION

251 LEAD-PLATINUM BI-ELECTRODES *L. L. Shreir*

Platinum Metals Rev., April, 1959, 3(2), 44-46.

A platinum micro-electrode in the surface of a lead anode which is polarised in a chloride solution, results in the formation of a protective film of lead dioxide. Among the obvious applications of such a system are cathodic protection and electroplating.

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252 CORROSION INHIBITORS IN AUTOMOTIVE COOLANTS: POLARISATION OF SOLDER AND COPPER *M. Levy*

Ind. Eng. Chem., Feb., 1959, 51(2), 209-210.

The author's previous work is extended to cover the action of couples between copper and 50/50 lead-tin solder in both water and glycol solutions containing various inhibitors.

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253 CORROSION OF LEAD PIPE *E. L. Schmeling and B. Röschenbleck*

Werkstoffe u. Korrosion, Aug./Sept., 1958, 9(8/9), 529-532.

(In German.) Pits in lead waste pipes, showing presence of sulphide and carbonate, give rise to a study of electrochemical behaviour and weight loss of lead in various carbonate and sulphide solutions.

ELECTROLYSIS

254 THE EFFECT OF COBALT ON A LEAD ANODE IN SULPHURIC ACID *D. F. A. Koch*

Electrochim. Acta, April, 1959, 1(1), 32-38.

Potential vs time curves at constant current density are studied, using lead anodes in sulphuric acid with and without the addition of cobalt. Cobalt is believed to reduce the oxygen overpotential and cause the use of current for evolution of oxygen in preference to oxidation of lead sulphate.

ELECTROPLATING

255 LEAD PLATING OF COPPER CHROME-PLATING ANODES FOR GUN BARRELS *F. A. Heiser and J. E. Hyde*

Plating, April, 1959, 46(4), 385-388.

A special anode made of lead-plated copper is used for chrome plating gun barrels. The method is claimed to be cheaper, safer, and to produce an anode which requires less repair and is better in performance than an anode which was lead-coated by burning processes.

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256 ELECTROPLATING OF TIN ALLOY SOLDERABLE COATINGS, ON FERROUS AND NON-FERROUS BASIS METALS *A. M. Howard and L. R. Rogers*

Plating, May, 1959, 46(5), 484-487.

Discusses the application of tin-lead and other alloys; comparative shelf-life of coatings on ferrous or copper-base alloys, and stripping of coatings. Also mentions patented method of plating aluminium wire using lead-zinc alloy followed by copper.

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257 ENGINEERING USES OF PLATED COATINGS *L. F. Spencer*

Met. Finishing, May, 1959, 57(5), 48-54.

Describes operating conditions of the bath for lead-tin alloy coatings and also the applications of such coatings.

HEALTH

258 HYGIENE OF WELDING IN U.S. NAVAL SHIP-YARDS *E. D. Storlazzi*

Arch. Ind. Health, March, 1959, 19(3), 307-311.

Precautions taken in various cases, including leadburning, are described.

LEAD — GENERAL

259 THE ANODIC OXIDES OF LEAD *J. Burbank*

J. Electrochem. Soc., May, 1959, 106(5), 369-376.

X-ray and electron diffraction methods used to identify various anodic oxides formed on lead under varying potential and pH values. Potential vs pH diagrams are given and the domains of occurrence of the various oxides are determined.

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260 FORMING SHEET METAL BY USE OF EXPLOSIVES UNDER WATER *General Dynamics Corporation Convair Division*

Sheet Met. Ond., May, 1959, 36, 361, 364.

Describes successful use of "Dynaforming" process, for forming sheet metal under water, with lead and other materials from .0015 to 0.5 ins. thick.

MECHANICAL PROPERTIES

261 RECRYSTALLISATION OF LEAD DURING CREEP *R. C. Gifkins*

J. Inst. Metals, April, 1959, 87(8), 255-261.

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262 SYMPOSIUM ON BASIC MECHANISMS OF FATIGUE. (BOSTON, JUNE, 1958) *American Society for Testing Materials*

ASTM Spec. Tech. Pubn. 237, 1959, 121 pp. ASTM, Philadelphia. $3.75.

Among the six papers recorded is one on experiments on lead and other metals, entitled "Internal Friction, Plastic Strain and Fatigue in Metals and Semiconductors" by W. P. Mason.

METALLURGY

263 A REDETERMINATION OF THE VOLUME CHANGES ON SOLIDIFICATION AND FUSION OF LEAD-BISMUTH ALLOYS NEAR TO THE EUTECTIC COMPOSITION *C. T. Preston and G. H. Broomfield*

J. Inst. Metals, March, 1959, 87(7), 240.

Because of the discrepancies in figures quoted by various authorities, a new determination has been made. This shows a contraction on freezing of 1.52% of the solid volume for the eutectic alloy.

264 EQUIPMENT AND PRACTICE FOR CONTINUOUS CASTING AND ROLLING BY THE PROPERZI PROCESS — *J. B. Russell and F. R. Nichols*

J. Inst. Metals, March, 1959, 87(7), 209-219.

Although the discussion refers mainly to the production of aluminium, this process is currently of interest to the lead industry. Construction and operation of both the casting machine and the rolling mill is described, as are metal preparation and maintenance.

MISCELLANEOUS

265 CHIP FORMATION IN METAL CUTTING: A HYDRODYNAMIC THEORY — *M. M. Lamm*

Engineering, April 3, 1959, 187, 444-446.

Explanation of chip formation in terms of plastic squeezing of metal between tool face and body of metal being machined.

POWDER METALLURGY

266 ELASTIC DEFORMATION OF METAL POWDER DURING PRESSING — *W. Rutkowski*

Neue Hütte, Feb., 1959, 4(2), 110-113.

(In German.) Curves are obtained for deformation vs pressure, for lead and other metal powders, and their significance is discussed.

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267 WROUGHT MATERIALS, PARTICULARLY STRIP, FORMED BY POWDER METALLURGY FROM ZINC AND ZINC-LEAD ALLOYS — *H. Weik, G. Ogierrmann and R. Ergang*

Metall, May, 1959, 13(5), 398-404.

(In German.) Lead contents up to 10% in alloy strip produced by pressing and rolling mixed powders. Strip compared with cast and rolled material. General strength is similar but elongation is better with powder product. Up to 5% lead-zinc alloys give a powder product which is more corrosion resistant in a salt-spray test.

REFINING

268 REFINING LEAD FROM ARSENIC, TIN AND ANTIMONY BY MOLTEN ALKALI MELTS — *G. G. Urazov, V. S. Lovchikov and B. M. Lipshits*

Izvest. Vyssh. Ucheb. Zaved. MVO, Razdel Tsvet. Met., 1958, No. 2, pp. 77-84.

(In Russian.) A new apparatus for refining lead is described. Chemically the method is the Harris process although no mention is made of this fact.

269 CONTRIBUTION TO THE BETTS PROCESS OF ELECTROLYTIC REFINING OF LEAD *W. Eisert*

Heue Hütte, Jan., 1959, 4(1), 29-35.

(In German.) Effect of anode conditions on purity of electrolytically-refined lead. Recommendations include uniform anode thickness, prevention of excessive consumption of anodes and regular removal of anode slime layer.

SMELTING

270 IMPORTANCE OF MAGNETIC PROPERTIES OF LEAD SLAGS *A. E. Guriev*

Izvest. Vyssh. Ucheb. Zaved, MVO, Razdel Tsvet, Met., 1958, No. 2, pp. 71-76.

(In Russian.) The relationship between lead content and magnetic permeability is shown to be linear.

STATISTICS

271 LEAD AND ZINC *"American Metal Market"*

Amer. Met. Market, March, 14, 1959, 66(50), Section 3, 48 pp.

Special report on marketing, uses, development, economics, statistics, scrap industry and mining industry, in the United States.

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272 METAL STATISTICS, 1948-1957. 45th ANNUAL ISSUE *Metallgesellschaft A.G.*

Book, Sept., 1958, 247 pp. Metallgesellschaft A.G. Frankfurt/Main.

Contains the usual statistical tables on lead and other metals, production and consumption for individual countries and for continents. There is a section dealing with metal prices and a detailed survey by countries for lead, copper, zinc, tin and aluminium.

WELDING

273 WELDING, CUTTING AND SOLDERING OF METALS *K. K. Chrenow*

Book, 1958, 440 pp. VEB Carl Marhold Verlag, Halle (Saale), Germany, 147.10 D.M. (£4 2s. 6d.).

(In German.) A description of various welding techniques is given and examples of actual welding of lead and other metals. Soldering and brazing are also discussed. This is a translation from Russian into German and the references are therefore to Russian publications.

PART II

PATENTS

ATOMICS

274 BELGIAN PATENT 574,650. "REINFORCEMENT FOR NUCLEAR SHIELDS"

COMMISSION A L'ENERGIE ATOMIQUE

Radiation shields made of lead can be strengthened to withstand mechanical forces by embedding reinforcing elements which, by nature of their shape, surface condition, or coating, will successfully adhere to the lead. An example is quoted of a steel grid embedded in a lead slab by casting the lead around it.

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275 S. AFRICAN PATENT 179/59. "REINFORCING LEAD COMPONENTS DESIGNED FOR RADIATION PROTECTION"

COMMISSION A L'ENERGIE ATOMIQUE

The process is explained in Belgian Patent 574,650 above.

BATTERIES

276 AUSTRALIAN PATENT 43050/58. "BATTERY PLATES"

CHLORIDE BATTERIES LTD.

This is a tubular type plate, the tubes being rectangular in cross-section and made from a permeable fabric resistant to acid and oxidation. The fabric is stiffened by an acid-resistant resin such as phenol-formaldehyde. Between the tubes are webs of fabric woven so that they are rigid in compression, thus providing strong supports between the opposite walls of adjacent tubes.

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277 GERMAN PATENT 1059991. "BATTERY PLATES"

R. BOSCH

Self-discharge of a battery plate is often attributed to the deposition of antimony on the negative paste. This invention claims to reduce this by removing antimony from the surface layers of the lead antimony grids by glow discharge, electrolysis, acid etching, etc. Further, the active mass contains materials such as plastic powders which prevent the deposition of antimony on the negative plate.

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278 SOUTH AFRICAN PATENT 891/59. "BATTERY PLATES"

THE ELECTRICAL STORAGE BATTERY CO.

The atmospheric oxidation and subsequent deterioration of a dry negative battery plate can be retarded by dispersing a vapour through the interstices of the sponge lead, which subsequently condenses to provide an oily film over all the surface of the material.

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279 INDIAN PATENT 6380. "SEPARATORS"

CHLORIDE ELECTRICAL STORAGE CO. LTD.

Separator material is corrugated, and solid ribs are formed by adhesion, when the walls of the corrugations are brought together.

280 BRITISH PATENT 817,079. "BATTERY ASSEMBLY—ARRANGEMENT OF SEPARATORS"

L. FULLER

This relates to batteries of the so-called dry type, in which the whole of the liquid electrolyte is absorbed in the separators. To prevent the bulging of the frame, the separators are made sufficiently soft to allow the plates to become embedded in them. This enables the outside of the metal frames to be fastened permanently in position even when the plates are very thin and the positives converted almost completely to lead peroxide.

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281 BRITISH PATENT 815,698. "DRYING CHARGED PLATES"

W. R. GRACE & CO.

It is stated here that charged plates may be dried by hot air without harmful oxidation of the negatives if the velocity and the temperature of the air are carefully controlled within certain limits. A formula is given connecting the temperature and the velocity. It is suggested that suitable values in practice are 8,000 ft. per minute and 360°F.

CABLES

282 BRITISH PATENT 816,808. "LEAD ALLOYS FOR CABLE SHEATHING"

BRITISH NON-FERROUS METALS RESEARCH ASSOCIATION

A desirable alloy for a cable sheath should be easy to extrude, have a high resistance to fatigue in service and a good creep resistance. These characteristics should be retained over long periods, if necessary, at slightly elevated temperatures. An alloy proposed for this application has the composition Sb 0.1/1%, As 0.01/0.05%, Te 0.01/0.1%, Bal. Pb. This material has a suitable grain size in the extruded condition and a high degree of structural stability.

COATINGS

283 AUSTRALIAN PATENT 41096/58. "BONDING LEAD TO ALUMINIUM"

KNAPP MILLS INC.

The first stage of this process is to coat the aluminium with a layer of nickel; a thin coat of the tin-lead eutectic is next applied to the nickel. A similar tin-lead eutectic layer is applied to the lead and these two eutectic coatings are partially melted and the two sheets pressed together with the eutectics face to face. The whole is cooled before the pressure is released.

ELECTRICAL

284 BRITISH PATENT 816,036. "PRIMARY CELL"

S. RUBEN

Compressed discs of bismuth sulphate or antimony sulphate are electrically conductive and will act as solid electrolytes in a primary cell. Such a unit can be made having a positive terminal of lead dioxide, an electrolyte as stated and a negative terminal of Inconel giving a potential of approximately 1.5 volts. Alternatively, carbon or graphite may be used as a negative electrode to give a cell of higher stability but lower voltage. The merit of this unit is that it has a reasonably long shelf life.

EXTRACTION

285 GERMAN PATENT 1,062,643. "RECOVERING OF LEAD FROM SLURRIES"

F. ZRENNER

Lead can be recovered from ore slurries by leaching with ferric chloride or hydrochloric acid, to obtain a solution from which the metal is recovered by cementation with iron powder. An improvement is effected by coating the iron particles with a more electro-positive metal, such as copper.

METALLURGY

286 GERMAN PATENT 1,059,188. "CONDENSATION OF ZINC VAPOUR"

METALLURGICAL PROCESSES LTD. & NATIONAL SMELTING CO. LTD.

This is a modification of British Patent 572,961, in which agitated molten lead is used as a medium for condensing zinc vapour. In this invention molten zinc is used as the condensing medium and is cooled by circulating a layer of molten lead beneath it in the condenser. The lead is withdrawn and cooled in an external unit and then returned to the condenser, together with any zinc which has separated during the cooling.

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287 INDIAN PATENT 62,807. "CONDENSATION OF ZINC"

METALLURGICAL PROCESSES LTD.

This process is similar to that described in German Patent 1,059,188 above.

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288 GERMAN PATENT 1,059,190. "LEAD ALLOYS"

STOLL BERGER ZINK A.G.

This deals with the production of master alloys of lead, the other constituents being fairly high melting-point metals such as copper, nickel, cobalt, chromium or manganese. One or more of these is mixed with lead so that the composition, when heated, lies within the miscibility gap of the alloy diagram. When fully miscible the molten mixture is emulsified by shaking, etc., and then rapidly quenched. The form of this material, when added to a large quantity of molten lead at a comparatively low temperature, will enable the added element to dissolve easily.

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289 AUSTRALIAN PATENT 42472/58. "SEPARATION OF LEAD AND ZINC"

NATIONAL SMELTING CO. LTD.

Pure zinc can be recovered from zinc of low lead content by vacuum distilling the mixture at 450/500°C. At this temperature the vapour is virtually free from lead. Further, it is possible to vacuum distil such a mixture containing a higher proportion of lead and condense the vapour (which may contain a little lead) in a circulating stream of molten zinc at a temperature below that of the original mixture. Zinc vapour is simultaneously evaporated from this circulating stream of zinc and condensed at a still lower temperature.

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290 AUSTRALIAN PATENT 41505/58. "REMOVING ZINC FROM LEAD"

AMERICAN SMELTING & REFINING CO.

The zinc is volatilised from molten lead in vacuo. The surface of the pool of molten metal is caused to flow outwards in all directions towards the periphery at a velocity sufficient to produce waves on the surface, thereby facilitating the distillation of the zinc.

291 GERMAN PATENT 1,056,839. "LEAD ALLOYS"

COP-SIL-LOY INC.

Anti-friction alloys of 30%–70% lead for self-lubricating bearings are made by introducing lead into molten copper and/or silver, covered with a protective flux, and then stirring the mixture vigorously, while the temperature is raised to approximately the melting point of the harder metal. It is claimed that bearings made from alloys so manufactured will withstand temperatures of about 600°C above the melting point of pure lead, before the latter will separate from the silver or copper.

REFINING

292 GERMAN PATENT 1,060,150. "PURIFICATION BY MEANS OF MERCURY"

SIEMENS & HALSKE A.G.

Material, such as lead, for semi-conductor purposes may be purified by an electrolytic process involving mercury. The impure metal is the anode and mercury the cathode. The amalgam as formed diffuses through more mercury to a second cell, where it forms the anode. The cathode of the second cell is thus built up from metal of a high purity.

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293 GERMAN PATENT 1,056,838. "HIGH PURITY LEAD"

TECKNIK & HANDELS A.G.

High purity lead can be produced directly from lead ores, oxides, scrap, etc., by heating with molten caustic soda and about 5% of a weak reducing agent (e.g. coke fines) at 550/600°C. The resulting lead is 99.99% pure and the impurities are converted to their sodium salts or insoluble residues. Silver and antimony must be absent.

SOLDER

294 BRITISH PATENT 813,586. "MECHANICAL SOLDERING"

STANDARD TELEPHONES & CABLES LTD.

Solder can be applied to a number of discreet positions on a single workpiece by passing the latter over the surface of a bath of molten solder, which contains a number of iron bits mounted vertically, the position of each corresponding to the point on the workpiece on which the solder is to be deposited. When the bits are raised, the workpiece is soldered at appropriate points. Preferably a terminal is projected from the workpiece and this is accommodated in a depression in the corresponding iron bit.

Charles Skilton Ltd., Printers, Biggleswade, Beds.